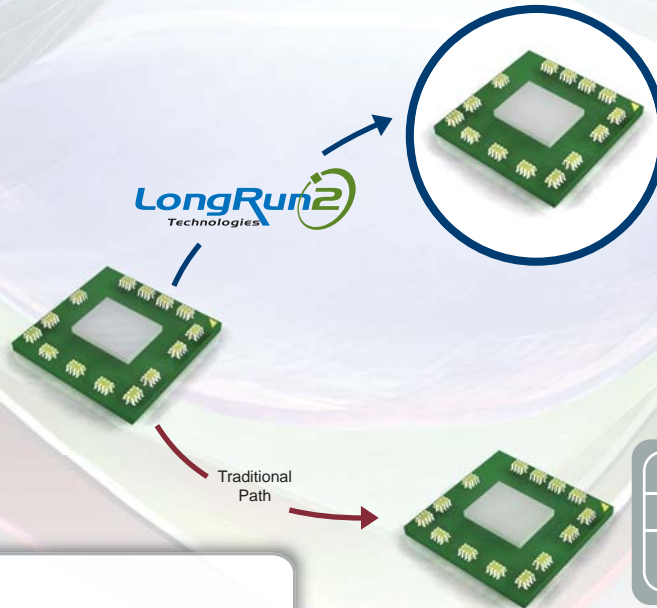


Transmeta® LongRun2™ Technologies

Applications

- ✓ High Performance Computing Applications
- ✓ Mobile Computing Applications
- ✓ Wireless Baseband and Applications Processors
- ✓ Graphics Processors
- ✓ Communications Devices
- ✓ Mobile Gaming Applications
- ✓ Mobile and High Definition Media Processors
- ✓ System on Chip (SOC) Applications



Benefits with LongRun2

- ✓ Rapidly Retrofit Existing Designs
- ✓ Minimize Active Power
- ✓ Minimize Standby Power
- ✓ Improve Yields
- ✓ Lower Manufacturing Costs
- ✓ Adaptive Performance Boost
- ✓ Reduce Die Size

Potential Issues with traditional migration

- ✓ Higher power specifications
- ✓ Wider distribution in device frequency and power

The Challenges:

Semiconductor designers migrating existing devices or starting new designs in advanced nanoscale process geometries (90nm, 65nm and finer) face two major challenges. First, the exponential growth of leakage power may result in an increase in active power, average or nominal power, standby power and burn-in power. Second, the expanding variations between transistor leakage and timing parameters result in a wider distribution between minimum frequency and maximum power consumption of parts. Wider distributions may prevent parts from achieving 100% yield within a given power and frequency specification. Semiconductor designers need new innovative technologies to combat the effects of increasing leakage power and expanding process variations.

A Solution: LongRun2 Technologies

LongRun2 Technologies is a suite of advanced power management, leakage control and process compensation technologies that can diminish the negative effects of increasing leakage power and process variations in advanced nanoscale designs. LongRun2 Technologies addresses these challenges with a comprehensive set of solutions that include: advanced algorithms, innovative circuits, unique devices and structures, process techniques, software and manufacturing optimization methods. Transmeta licenses its LongRun2 Technologies to semiconductor companies and has thus far licensed those technologies to NEC, Fujitsu, Sony and Toshiba.

Rapidly Retrofit Existing Designs

LongRun2 Technologies provides unique semiconductor structures that can be rapidly retrofitted into existing designs or employed in new designs. These unique structures allow tuning of transistors after the semiconductor devices have been manufactured. Coupled with advanced circuits and process techniques, transistors can then be tuned to reduce both leakage power and minimize process variations.

Minimize Active Power

Active power is the amount of power a semiconductor device is consuming when operating at some frequency and working on a given set of tasks. Active power is a combination of dynamic or switching power and leakage power. With the exponential increase in leakage power in advanced nanoscale designs, active power is increasing. LongRun2 Technologies can be used to reduce both the worst case active power as well as the nominal or average power consumption. LongRun2 Technologies include power reduction methods to control active power include dynamic voltage / frequency scaling and dynamic threshold voltage control.

Minimize Standby Power

Standby power is a lower power state into which the device is placed when there are no pending tasks. Standby power is heavily influenced by leakage power since the device is not operating and has no dynamic or switching power component. LongRun2 Technologies provide unique semiconductor structures, algorithms and advanced circuits that can be used to dynamically tune the transistors to minimize leakage in the standby state.

Improve Yields

A semiconductor device may be specified at the worst case power and frequency in order to capture the largest distribution of parts. The expanding variations between transistor leakage power and timing parameters lead to a wider distribution between faster but higher power parts and slower, lower power parts. This results in a compromised device specification or product offering, both in terms of power and frequency. LongRun2 Technologies provide multiple solutions that can be used to tighten the distribution between the highest power and lowest frequency part. The solutions include threshold voltage control which utilizes unique semiconductor structures and advanced process and circuit technologies.

Transmeta® LongRun2™ Technologies



Manufacturing Cost Reduction

Burn-in is a process where semiconductor devices are exposed to high voltages and temperatures to ensure long term device reliability and stability. The exponential increase in leakage power in advanced nanoscale geometries coupled with the higher voltages and temperatures used during burn-in can result in a significant increase in power consumption and heat dissipation of a semiconductor device. This increase will require more expensive test equipment and significantly increase manufacturing costs. LongRun2 Technologies provide techniques to reduce leakage power during burn-in, which can lower manufacturing costs.

Die Size Reduction

LongRun2 Technologies provide unique semiconductor structures coupled with advanced circuits that can be used to reduce overall die size in new designs while also improving the electrical characteristics of semiconductor devices in new or existing designs.

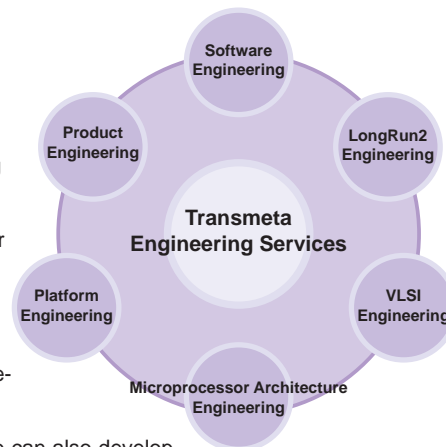
Adaptive Thermal Performance Boost

The frequency specification for most semiconductor devices is provided at the maximum operating temperature of the device. However, most devices can operate at a higher frequency at lower temperature. LongRun2 Technologies enable semiconductor devices to temporarily increase the frequency of a semiconductor device at lower temperatures optimizing the amount of performance a device can supply.

Synergistic Engineering Services

In addition to licensing LongRun2 Technologies, Transmeta also provides a complete set of synergistic engineering services to quickly integrate low power technologies and software control into customer semiconductor designs.

- The LongRun2 Group is available for low power consulting, complex power modeling analysis of existing and new designs and facilitating in the integration of LongRun2 Technologies.
- The VLSI Group provides LongRun2 integration support as well as advanced high speed / low power analog and digital circuit design, verification and validation services while working with a variety of EDA / CAD tools. The VLSI Group has extensive experience designing and productizing multiple advanced microprocessor designs.
- The Microprocessor Architecture Group can consult on existing or new designs to improve performance-per-watt efficiency for current and future needs.
- The Software Group provides consulting services on real time low power control algorithms. The group can also develop compilers, emulators and simulators for existing or new microprocessor designs.
- The Product Engineering group works closely with multiple semiconductor foundries and testing facilities worldwide to ensure quick and seamless adoption of LongRun2 Technologies.
- The Platform Engineering group provides high speed package design, advanced circuit board design and layout services as well as firmware design and development. The group also works with worldwide ODM partners to facilitate quick mass production of platforms.



Transmeta
CORPORATION

About Transmeta Corporation

Transmeta Corporation develops and licenses innovative computing, microprocessor and semiconductor technologies and related intellectual property. Founded in 1995, we first became known for designing, developing and selling our highly efficient x86-compatible software-based microprocessors, which deliver a balance of low power consumption, high performance, low cost and small size suited for diverse computing platforms. We now also provide, through strategic alliances and under contract, engineering services that leverage our microprocessor design and development capabilities. In addition to our microprocessor product and services businesses, we also develop and license advanced power management technologies for controlling leakage and increasing power efficiency in semiconductor and computing devices.

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